OBSERVATIONS & RECOMMENDATIONS

After reviewing data collected from **HARANTIS LAKE** the program coordinators recommend the following actions.

FIGURE INTERPRETATION

- Figure 1: These graphs illustrate concentrations of chlorophyll-a in the water column. Algae are microscopic plants that are a natural part of lake ecosystems. Algae contain chlorophyll-a, a pigment necessary for photosynthesis. A measure of chlorophyll-a can indicate the abundance of algae in a lake. The historical data (the bottom graph) show a *slightly improving, but variable,* in-lake chlorophyll-a trend, meaning concentrations are decreasing. Algal concentrations were elevated in June and July and the increased inlet flow this season likely caused excess nutrients to be added to the lake, which helped the algae to grow. Also, the shallow depth of the lake allows the water to mix continuously throughout the summer, which keeps nutrients circulating instead of settling out. Overall, algal abundance in every month fell below the NH mean reference line for the first time this season! While algae are present in all lakes, an excess amount of any type is not welcomed. Concentrations can increase when there are external and internal sources of phosphorus, which is the nutrient algae depend upon for growth. It's important to continue the education process and keep residents aware of the sources of phosphorus and how it influences lake quality.

- Figure 2: Water clarity is measured by using a Secchi disk. Clarity, or transparency, can be influenced by such things as algae, sediments from erosion, and natural colors of the water. The graphs on this page show historical and current year data. The lower graph shows a *stable* trend in lake transparency. Water clarity increased in September due to the decrease in algal abundance at that time. The 2000 sampling season was considered to be wet and, therefore, average transparency readings are expected to be slightly lower than last year's readings. Higher amounts of rainfall usually cause more eroding of sediments into the lake and streams, thus decreasing clarity.

- Figure 3: These figures show the amounts of phosphorus in the epilimnion (the upper layer in the lake) and the hypolimnion (the lower layer); the inset graphs show current year data. Phosphorus is

the limiting nutrient for plants and algae in New Hampshire waters. Too much phosphorus in a lake can lead to increases in plant growth over time. These graphs show a *fairly stable* trend for the upper water layer, and an *improving* trend in the lower water layer. It may be too early to discuss phosphorus trends for Harantis Lake, as the lake joined VLAP only 4 years ago. It will be a few more years before we can accurately assess these trends. Hypolimnetic phosphorus concentrations were below the NH median reference line, and a continuation of this trend will help to keep unwanted algal growth from occurring. Epilimnetic phosphorus concentrations were back to normal levels this season from the unusual results of last season. One of the most important approaches to reducing phosphorus levels is educating the public. Humans introduce phosphorus to lakes by several means: fertilizing lawns, septic system failures, and detergents containing phosphates are just a few. Keeping the public aware of ways to reduce the input of phosphorus to lakes means less productivity in the lake. Contact the VLAP coordinator for tips on educating your lake residents or for ideas on testing your watershed for phosphorus inputs.

OTHER COMMENTS

- As part of the state's lake trophic classification program, DES biologists performed a comprehensive lake survey on Harantis Lake. All public lakes in the state are surveyed every ten to fifteen years. In addition to the tests normally carried out by VLAP, biologists tested for some important metals, nitrogen, created a map of the bottom contours of the lake (bathymetry), and mapped the abundance and distribution of aquatic plants along the shores. For a complete copy of the raw data from the survey, please contact the DES Biology Section at (603) 271-2963. A final report should be available in 2002 and a copy can be found at any state library.

- Conductivity in the North Cove inlet increased this season (Table 6) and was significantly higher than in 1998. Conductivity increases often indicate the influence of human activities on surface waters. Septic system leachate, agricultural runoff, iron deposits, and road runoff can all influence conductivity. It would be useful to uncover the reasons for increased conductivity as we continue to monitor the lake. If conductivity continues to increase in the inlet we recommend testing additional sites upstream to see if any pollution sources are present.

- E. *coli* concentrations continue to be low for the lake (Table 12). Concentrations at all sites tested were well below the state standard of 406 counts per 100 mL set for Class B surface waters, and 88 counts per 100 mL set for Public Beaches.

- Total phosphorus concentration decreased in the lake this year (Table 8). This is a positive sign for the lake. The increase in rainfall might have caused an increase in phosphorus entering the lake from the watershed, however this was not evident in the samples collected. We hope to see this trend continue for Harantis Lake.

NOTES

- Monitor's Note (6/23/00): New housing developments on lake. More algae clumps within lilies and grasses than last year.

- Biologist's Note (6/23/00): Weeds identified as *Callitriche*.

- Monitor's Note (7/21/00): Pickerelweed, Cardinal flower, ducks (7), yellow and white pond lilies; blue heron. Note: rinsed dam outlet TP bottle by mistake, therefore no TP for dam outlet.

- Monitor's Note (9/08/00): Building around lake (East side). Blue heron, Cardinal Flower, cranberries. Weed dying. Last Tuesday/Wednesday very cool weather, around 38F at night.

USEFUL RESOURCES

Soil Erosion and Sediment Control on Construction Sites, WD-WEB-12, NHDES Fact Sheet, (603) 271-3503 or www.state.nh.us

Best Management Practices to Control Nonpoint Source Pollution: A Guide for Citizens and Town Officials, NHDES-WD 97-8, NHDES Booklet, (603) 271-3503

Aquatic Plants and Their Role in Lake Ecology, WD-BB-44, NHDES Fact Sheet, (603) 271-3503 or www.state.nh.us

Diet for a Small Lake: A New Yorker's Guide to Lake Management. Federation of Lake Associations, Cazenovia, NY, 1990. (800) 796-FOLA, or www.nysfola.org

Save Our Streams Handbook for Wetlands Conservation and Sustainability. (800) BUG-IWLA, or visit www.iwla.org

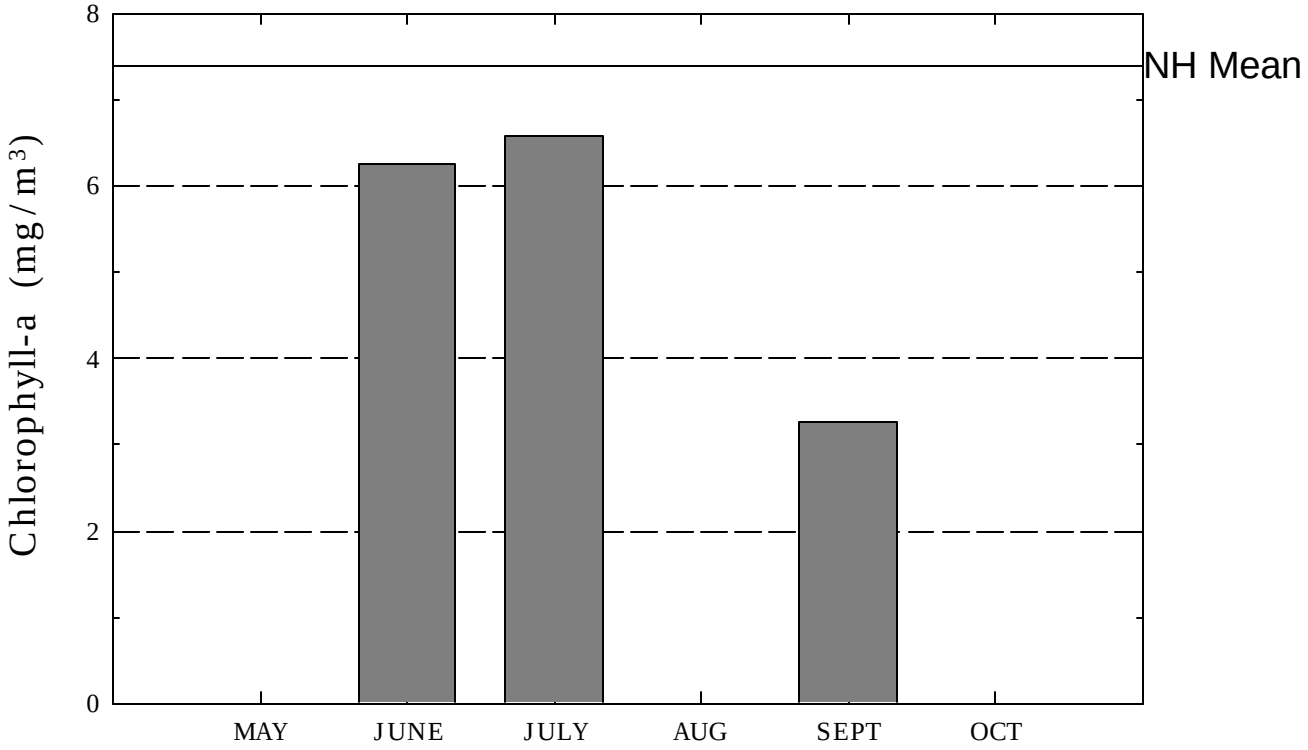
Bacteria in Surface Waters, WD-BB-14, NHDES Fact Sheet, (603) 271-3503 or www.state.nh.us

Answers to Common Lake Questions, NHDES-WSPCD-92-12, NHDES Booklet, (603) 271-3503.

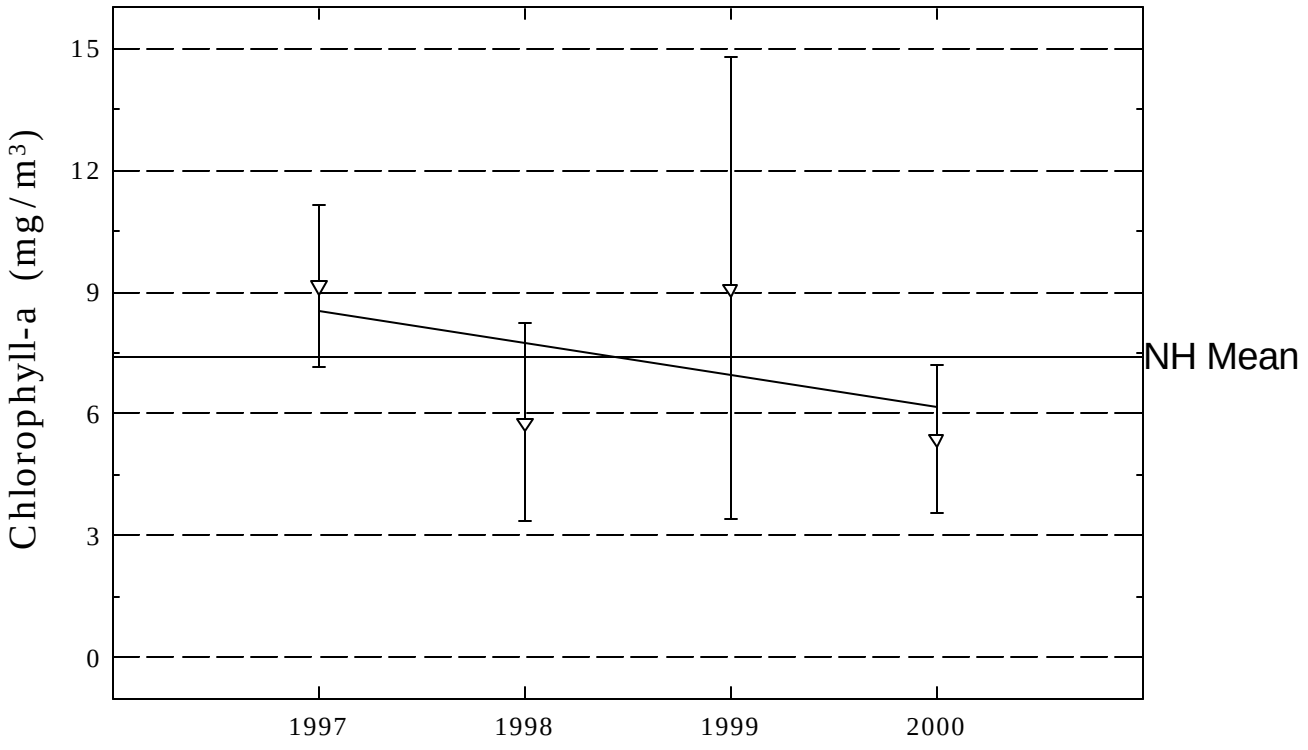
Through the Looking Glass: A Field Guide to Aquatic Plants. North American Lake Management Society, 1988. (608) 233-2836 or www.nalms.org

Harantis Lake

Figure 1. Monthly and Historical Chlorophyll-a Results



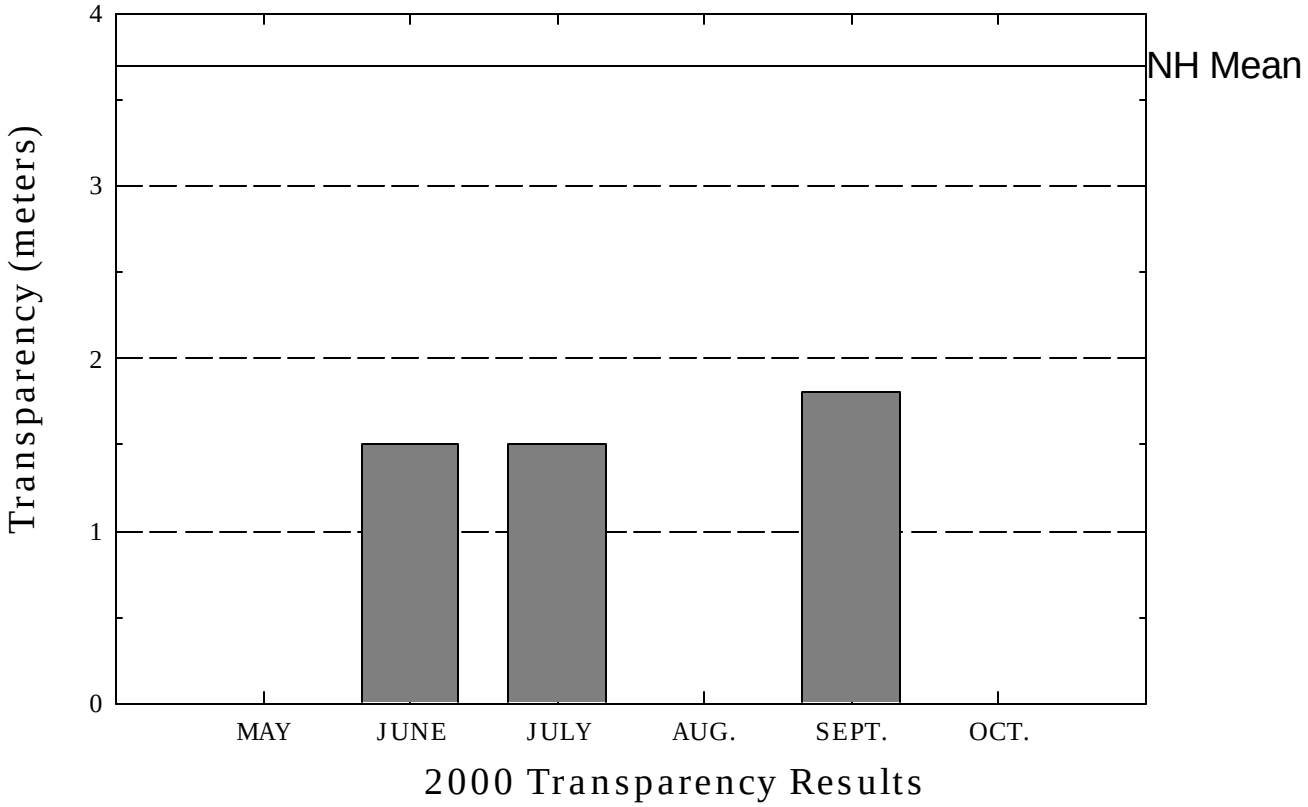
2000 Chlorophyll-a Results

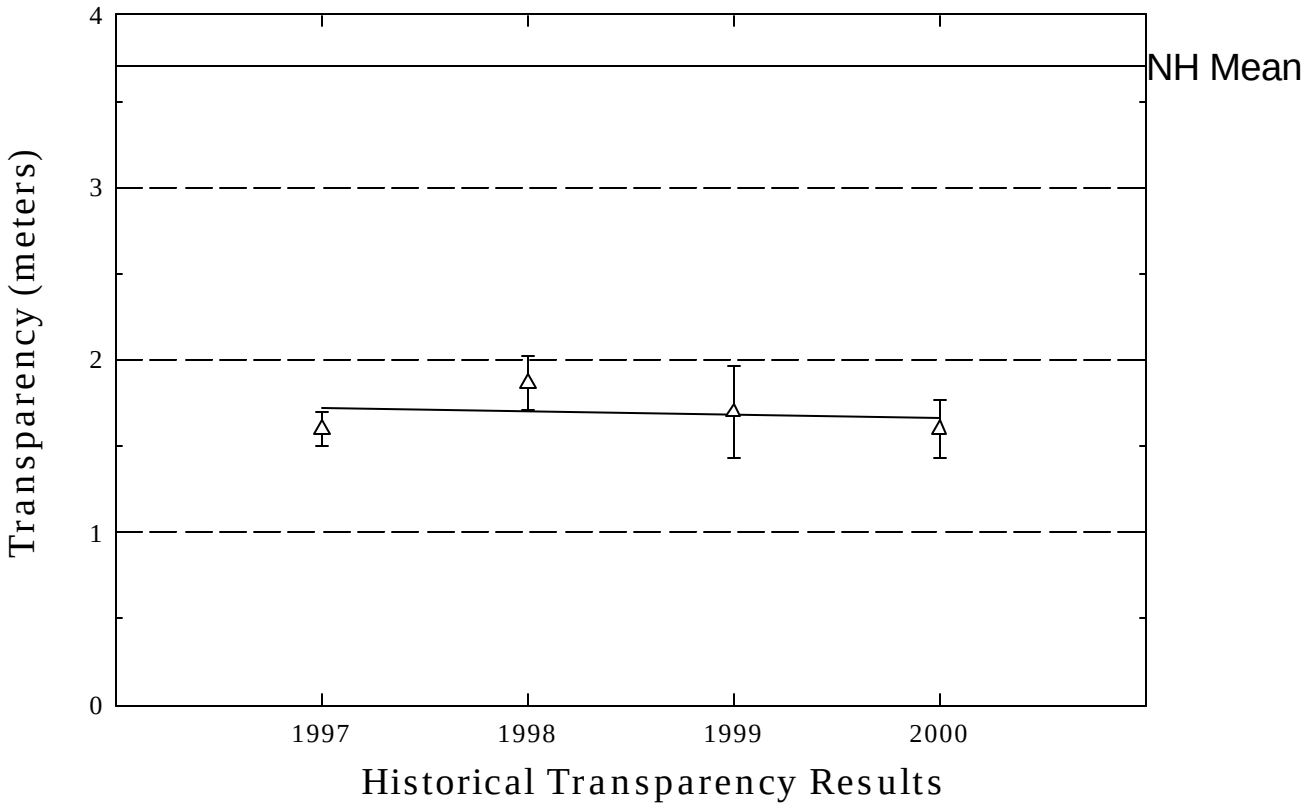


Historical Chlorophyll-a Results

Harantis Lake

Figure 2. Monthly and Historical Transparency Results





Harantis Lake

Figure 3. Monthly and Historical Total Phosphorus Data.

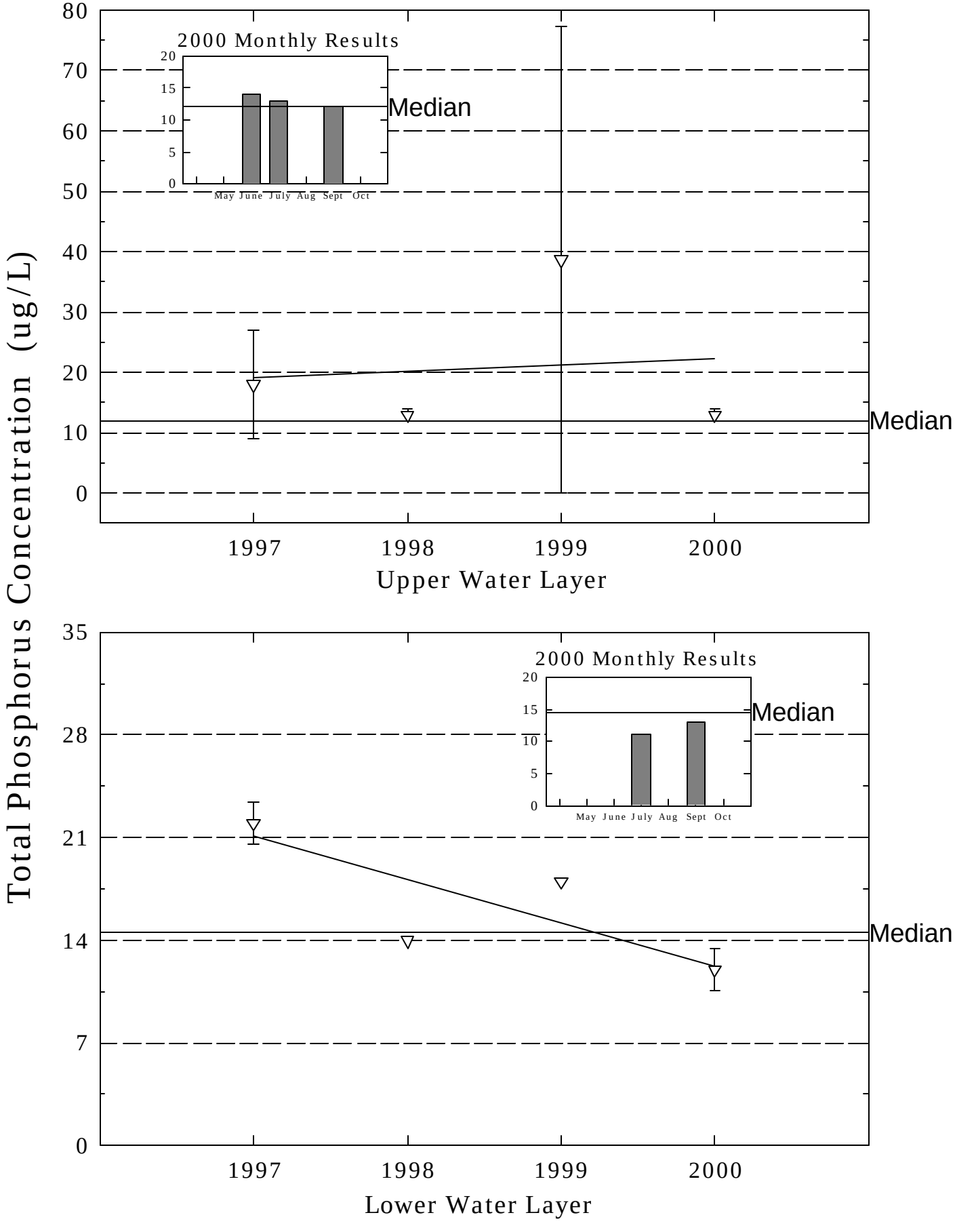


Table 1.

HARANTIS LAKE

CHESTER

Chlorophyll-a results (mg/m^3) for current year and historical sampling periods.

Year	Minimum	Maximum	Mean
1997	6.94	10.85	9.15
1998	3.87	8.53	5.78
1999	4.38	15.41	9.09
2000	3.27	6.59	5.37

Table 2.

HARANTIS LAKE

CHESTER

Phytoplankton species and relative percent abundance.

Summary for current and historical sampling seasons.

Date of Sample	Species Observed	Relative % Abundance
06 / 19 / 1997	DINOBRYON	45
	CHRYSOSPHAERELLA	35
	RHIZOSOLENIA	10
06 / 25 / 1998	DINOBRYON	85
	ASTERIONELLA	4
06 / 24 / 1999	RHIZOSOLENIA	62
	CYCLOTELLA	5
	CHRYSOSPHAERELLA	5
06 / 23 / 2000	RHIZOSOLENIA	71
	DINOBRYON	19
	MALLOMONAS	5

Table 3.

HARANTIS LAKE

CHESTER

Summary of current and historical Secchi Disk transparency results (in meters).

Year	Minimum	Maximum	Mean
1997	1.5	1.7	1.6
1998	1.7	2.0	1.8
1999	1.5	2.0	1.7
2000	1.5	1.8	1.6

Table 4.

HARANTIS LAKE

CHESTER

pH summary for current and historical sampling seasons.
Values in units, listed by station and year.

Station	Year	Minimum	Maximum	Mean
BEAVER INLET				
	1997	6.06	6.09	6.07
	1998	5.25	5.73	5.43
	2000	5.62	6.30	5.86
DAM OUTLET				
	1997	6.27	6.49	6.38
	1998	5.47	6.62	5.83
	1999	6.31	6.70	6.45
	2000	6.19	6.56	6.30
EPILIMNION				
	1997	6.23	6.51	6.35
	1998	5.72	6.66	6.00
	1999	6.40	6.75	6.60
	2000	6.07	6.50	6.30
GAGNAN INLET				
	1997	5.30	5.30	5.30
	1998	4.76	5.36	4.96
	2000	5.01	5.05	5.03
HYPOLIMNION				
	1997	6.21	6.31	6.26
	1998	5.91	5.91	5.91
	1999	6.39	6.39	6.39
	2000	6.39	6.49	6.44

Table 4.

HARANTIS LAKE

CHESTER

pH summary for current and historical sampling seasons.
Values in units, listed by station and year.

Station	Year	Minimum	Maximum	Mean
NORTH COVE				
	1998	5.85	5.85	5.85
	2000	6.09	6.47	6.24

Table 5.

HARANTIS LAKE

CHESTER

Summary of current and historical Acid Neutralizing Capacity.
Values expressed in mg/L as CaCO .

Epilimnetic Values

Year	Minimum	Maximum	Mean
1997	3.00	3.60	3.33
1998	2.30	4.10	3.07
1999	4.30	5.60	4.87
2000	4.30	5.70	4.80

Table 6.

HARANTIS LAKE

CHESTER

Specific conductance results from current and historic sampling seasons. Results in uMhos/cm.

Station	Year	Minimum	Maximum	Mean
BEAVER INLET				
	1997	23.3	26.7	25.0
	1998	17.9	23.4	20.6
	2000	22.9	35.6	27.5
DAM OUTLET				
	1997	31.6	35.2	33.5
	1998	28.3	34.9	32.3
	1999	37.5	39.8	38.5
	2000	39.2	45.9	42.2
EPILIMNION				
	1997	33.2	35.9	34.3
	1998	33.3	37.9	35.2
	1999	38.2	40.5	39.3
	2000	41.2	45.8	42.9
GAGNAN INLET				
	1997	20.2	20.2	20.2
	1998	21.9	22.6	22.3
	2000	22.4	23.8	23.1
HYPOLIMNION				
	1997	33.8	38.1	35.9
	1998	34.7	34.7	34.7
	1999	38.4	38.4	38.4
	2000	40.0	45.6	42.8

Table 6.

HARANTIS LAKE

CHESTER

Specific conductance results from current and historic sampling seasons. Results in uMhos/cm.

Station	Year	Minimum	Maximum	Mean
NORTH COVE				
	1998	65.6	65.6	65.6
	2000	85.6	102.8	94.2

Table 8.

HARANTIS LAKE

CHESTER

Summary historical and current sampling season Total Phosphorus data. Results in ug/L.

Station	Year	Minimum	Maximum	Mean
BEAVER INLET				
	1997	26	29	27
	1998	15	22	18
	2000	9	18	14
DAM OUTLET				
	1997	11	20	16
	1998	10	11	10
	1999	13	15	14
	2000	8	8	8
EPILIMNION				
	1997	9	27	18
	1998	12	14	13
	1999	13	83	38
	2000	12	14	13
GAGNAN INLET				
	1997	45	45	45
	1998	13	44	28
	2000	14	15	14
HYPOLIMNION				
	1997	21	23	22
	1998	14	14	14
	1999	18	18	18
	2000	11	13	12

Table 8.

HARANTIS LAKE

CHESTER

Summary historical and current sampling season Total Phosphorus data. Results in ug/L.

Station	Year	Minimum	Maximum	Mean
NORTH COVE				
	1998	25	25	25
	2000	23	23	23

Table 9.

HARANTIS LAKE

CHESTER

Current year dissolved oxygen and temperature data.

Depth (meters)	Temperature (celsius)	Dissolved Oxygen (mg/L)	Saturation (%)
		June 23, 2000	
0.1	23.6	7.0	82.9
0.5	23.6	6.9	81.6
1.0	23.5	6.8	80.2
1.5	20.0	5.0	55.0
2.0	15.6	2.8	28.3

Table 10.

HARANTIS LAKE

CHESTER

Historic Hypolimnetic dissolved oxygen and temperature data.

Date	Depth (meters)	Temperature (celsius)	Dissolved Oxygen (mg/L)	Saturation (%)
June 19, 1997	2.0	20.5	5.5	60.0
June 25, 1998	2.0	17.7	7.1	73.0
June 24, 1999	2.0	22.5	8.8	101.4
June 23, 2000	2.0	15.6	2.8	28.3

Table 11.

HARANTIS LAKE

CHESTER

Summary of current year and historic turbidity sampling.
Results in NTU's.

Station	Year	Minimum	Maximum	Mean
BEAVER INLET				
	1997	0.6	0.9	0.8
	1998	0.4	0.4	0.4
	2000	0.4	2.2	1.0
DAM OUTLET				
	1997	0.6	1.4	0.9
	1998	0.4	0.6	0.5
	1999	0.6	1.3	0.9
	2000	0.3	0.6	0.4
EPILIMNION				
	1997	0.5	1.1	0.8
	1998	0.5	0.8	0.6
	1999	0.6	1.4	0.9
	2000	0.4	0.8	0.6
GAGNAN INLET				
	1997	0.9	0.9	0.9
	1998	0.3	0.9	0.6
	2000	0.2	0.4	0.3
HYPOLIMNION				
	1997	0.9	1.0	1.0
	1998	0.5	0.5	0.5
	1999	1.3	1.3	1.3
	2000	0.4	0.6	0.5
NORTH COVE				
	1998	0.8	0.8	0.8
	2000	0.6	0.7	0.6

Table 12.

HARANTIS LAKE

CHESTER

Summary of current year bacteria sampling.
Results in counts per 100ml.

Location	Date	E. Coli See Note Below
LOWER MID COVE		
	September 8	6
SOUTH COVE		
	September 8	10

NOTE: "<" means "less than" and ">" means "greater than"